

## CLAIMS

What is claimed is:

1 1. A method of allocating power in a rack mounted server system housing a server, the server  
2 coupled to a central power supply, the method comprising:  
3 requesting permission by the server to allocate power from the central power supply;  
4 analyzing power requirements of the server requesting allocation against a capability of the  
5 central power supply; and  
6 powering the server if power is available from the central power supply.

1 2. The method of allocating power as defined in claim 1 wherein analyzing power  
2 requirements of the server requesting allocation against the capability of the central power supply  
3 further comprises determining if the central power supply has available power to supply the server  
4 and still meet an operating condition.

1 3. The method of allocating power as defined in claim 2 wherein the operating condition is  
2 having a fully redundant capability from the central power supply.

1 4. The method of allocating power as defined in claim 2 wherein the operating condition is  
2 having sufficient available power to operate the server.

1 5. The method of allocating power as defined in claim 1 wherein requesting permission  
2 further comprises:

3 sending a request by the server to the central power supply across a primary  
4 communication pathway; and  
5 responding by the central power supply across the communication pathway.

1 6. The method of allocating power as defined in claim 5 wherein sending the request and  
2 responding across a communication pathway further comprises sending the request and responding  
3 across a serial communication pathway.

1 7. The method of allocating power as defined in claim 6 wherein sending the request and  
2 responding across a serial communication pathway further comprises sending the request and  
3 responding across an RS-485 serial communication pathway.

1 8. The method of allocating power as defined in claim 5 wherein requesting permission  
2 further comprises:

3 sending the request by the server across a first communication pathway to a chassis  
4 communication module;

5 relaying the request by the chassis communication module to a power supply  
6 communication module across the primary communication pathway;

7 polling individual power supplies in the central power supply to determine available power  
8 capacity;

9 responding by the power supply communication module with a response being one of  
10 permission granted and permission denied to allocate power.

1 9. The method of allocating power as defined in claim 1 further comprising:  
2 installing the server into a chassis mounted in the rack mounted server system;  
3 powering a communication device in the server which performs the requesting step;  
4 refraining from powering remaining portions of the server until permission is received by  
5 the communication device.

1 10. A power management system for allocating power in a rack mounted server system having  
2 a server mounted therein, the rack mounted server system also having a power supply system apart  
3 from the server, the server coupled to the power supply system, the power management system  
4 comprising:

5 a chassis communication module;

6 a power supply communication module;

7 a first communication pathway coupling the chassis communication module and the power  
8 supply communication module;

9 a second communication pathway coupling the server to the chassis communication  
10 module;

11 a third communication pathway coupling the power supply system to the power supply  
12 communication module;

13 wherein the server is adapted send a request for permission to allocate power from the  
14 power supply system across the second communication pathway to the chassis communication  
15 module;

16 wherein the chassis communication module is adapted to relay the request for permission to  
17 the power supply communication module across the first communication pathway; and

18 wherein the power supply communication module is adapted to poll the power supply  
19 system across the third communication pathway, receive results of that polling across the third  
20 communication pathway, and send a response to the server across the first communication  
21 pathway, the response being one of permission granted or permission denied.

1 11. The power management system as defined in claim 10 wherein the chassis communication  
2 module further comprises:

3 a random access memory array (RAM);

4 a read only memory (ROM);

5 a microcontroller controller coupled to the RAM and ROM, the microcontroller adapted to  
6 execute programs stored on the ROM;

7 said microcontroller coupled to both the first and second communication pathways;

8 wherein the microcontroller is adapted to receive the request for permission from the server  
9 across the second communication pathway and transmit that request for permission across the first  
10 communication pathway to the power supply communication module; and

11 wherein the microcontroller is further adapted to receive the response across the first  
12 communication pathway from the power supply communication module and to direct that response  
13 across the second communication pathway to the server.

1 12. The power management system as defined in claim 10 wherein the power supply  
2 communication module further comprises:

3 a random access memory array (RAM);

4 a read only memory (ROM);

5 a microcontroller controller coupled to the RAM and ROM, the microcontroller adapted to  
6 execute programs stored on the ROM;

7 said microcontroller coupled to both the first and third communication pathways;

8 wherein the microcontroller is adapted to receive the request for permission across the first  
9 communication pathway, and in response to the received request for permission, to poll power  
10 supply system across the second communication pathway; and

11 wherein the microcontroller is further adapted to receive results of the polling from the  
12 power supply system across the third communication pathway, and transmit the response to the  
13 server across the first communication pathway.

1 13. The power management system as defined in claim 10 wherein the first communication  
2 pathway further comprises a serial communication pathway.

1 14. The power management system as defined in claim 13 wherein the serial communication  
2 pathway further comprises an Institute for Electrical and Electronic Engineers (IEEE) RS-485  
3 serial communication pathway.

1 15. The power management system as defined in claim 10 where the second communication  
2 pathway further comprises a serial communication pathway.

1 16. The power management system as defined in claim 15 wherein the second communication  
2 pathway further comprises an I<sup>2</sup>C bus.

1 17. The power management system as defined in claim 10 wherein the third communication  
2 pathway further comprises a serial communication pathway.

1 18. The power management system as defined in claim 17 wherein the third communication  
2 pathway further comprises an I<sup>2</sup>C bus.

1 19. In a rack mounted server system having a plurality of computers powered by a central  
2 power supply system, a method of de-allocating power comprising:

3 monitoring a power demand of the plurality of computers;

4 requesting a non-critical computer of the plurality of computers to shut down if the power  
5 demand of the plurality of computers exceeds a threshold power demand;

6 repeating the monitoring step and requesting step until the power demand is equal to or less  
7 than the threshold power demand.

1 20. The method of de-allocating power in a rack mounted server system as defined in claim 19  
2 wherein monitoring the power demand further comprises polling individual power supplies in the  
3 central power supply system to determine a total power output of the power supply system.

1 21. The method of de-allocating power in a rack mounted server system as defined in claim 19  
2 wherein requesting a non-critical computer of the plurality of computers to shut down further  
3 comprises:

4 ranking each of the plurality of computers; and

5 requesting the shut down of at least one of the plurality of computers sequentially  
6 according to its ranking.

1 22. The method of de-allocating power in a rack mounted server system as defined in claim 19  
2 wherein requesting a non-critical computer of the plurality of computers to shut down if the power  
3 demand of the plurality of servers exceeds the threshold power demand further comprises  
4 requesting the non-critical computer to shut down if the power demand exceeds an operating  
5 maximum of the power supply system.

1 23. The method of de-allocating power in a rack mounted server system as defined in claim 22  
2 wherein requesting a non-critical computer of the plurality of computers to shut down if the power  
3 demand of the plurality of servers exceeds the threshold power demand further comprises  
4 requesting the non-critical computer to shut down if the power demand exceeds an amount where  
5 the power supply system is fully redundant.

1 24. A rack mounted computer system comprising:  
2 a plurality of computers mounted in the rack mounted computer system;  
3 a central power supply system mounted in the rack mounted computer system, the central  
4 power supply system coupled to and supplying power to the plurality of computers;  
5 a first communication pathway coupled between the plurality of computers and the power  
6 supply system;  
7 wherein each of the plurality of computers is adapted to request permission across the first  
8 communication pathway to draw power from the central power supply system; and

9 wherein a response to the request for permission is sent across the first communication  
10 pathway, the response based on an available power capacity of the central power supply system.

1 25. The rack mounted computer system as defined in claim 24 wherein the first communication  
2 pathway further comprises a serial communication pathway.

1 26. The rack mounted computer system as defined in claim 25 wherein the serial  
2 communication pathway further comprises an RS-485 serial bus.

1 27. The rack mounted computer system as defined in claim 24 further comprising:  
2 a chassis housing the plurality of computers, the chassis mounted in the rack mounted  
3 system;  
4 a chassis communication module coupled to the first communication pathway, the chassis  
5 communication module also coupled to the plurality of computers by way of a second  
6 communication pathway; and

7 wherein each of the plurality of computers requests permission to draw power from the  
8 central power supply system by sending those requests to the chassis communication module  
9 across the second communication pathway; and

10 wherein the chassis communication module forwards each request for permission to draw  
11 power across the first communication pathway to the central power supply system.

1 28. The rack mounted computer system as defined in claim 24 further comprising:  
2 said central power supply system comprising a plurality of individual power supplies;



3 a power supply communication module coupled to each individual power supply through a  
4 third communication pathway;

5 said power supply communication module generating the response to the request for  
6 permission to draw power by polling each individual power supply across the third communication  
7 pathway to determine remaining power capacity of the central power supply system, the power  
8 supply communication module sending the response across the first communication pathway.

1 29. The rack mounted computer system as defined in claim 28 further comprising:

2 a chassis housing the plurality of computers, the chassis mounted in the rack mounted  
3 system;

4 a chassis communication module coupled to the first communication pathway, the chassis  
5 communication module also coupled to the plurality of computers by way of a second  
6 communication pathway; and

7 wherein the plurality of computers request permission to draw power from the central  
8 power supply system by sending that request to the chassis communication module across the  
9 second communication pathway; and

10 wherein the chassis communication module forwards each request for permission to draw  
11 power across the first communication pathway to the central power supply system.

1 30. The rack mounted computer system as defined in claim 29 wherein the first communication  
2 pathway further comprises a serial communication pathway.

1 31. The rack mounted computer system as defined in claim 30 wherein the serial  
2 communication pathway further comprises an RS-485 serial bus.

1 32. The rack mounted computer system as defined in claim 29 wherein the second and third  
2 communication pathways further comprise serial communication pathways.

1 33. The rack mounted computer system as defined in claim 32 wherein each of the second and  
2 third serial communication pathways further comprise an I<sup>2</sup>C bus.

1 34. The rack mounted computer system as defined in claim 24 further comprising:  
2 a power supply communication module coupled to the plurality of computers across the  
3 first communication pathway, the power supply communication module also coupled to the central  
4 power supply system across a third communication pathway;

5 said central power supply further comprises:

6 a plurality of individual power supplies, each individual power supply having a  
7 health and status monitoring device associated therewith, each health and status monitoring device  
8 adapted to monitor an operating condition of its associated individual power supply; and

9 wherein each of said health and status monitoring devices communicates the  
10 operating condition of its associated individual power supply to the power supply communication  
11 module across the second communication pathway;

12 wherein the power supply communication module requests a non-critical computer of the  
13 plurality of computers to shut down when a health and status monitoring device indicates a  
14 change in the operating condition of its associated individual power supply.

1 35. The rack mounted computer system as defined in claim 34 wherein the power supply  
2 communication module requests the non-critical computer of the plurality of computers to shut  
3 down when a first health and status monitoring device for a first individual power supply indicates  
4 a failure of the first individual power supply.

1 36. In a rack mounted server system having a central power supply, the central power supply  
2 having at least two power supply assemblies, each power supply assembly having a  
3 communication module coupled to other communication modules and other devices across a  
4 communication pathway, a method of determining a primary communication module comprising:

- 5 checking for the presence of a primary communication module;  
6 promoting to a primary status if no primary communication module is found; and  
7 broadcasting the primary communication module status.

1 37. The method of determining a primary communication module as defined in claim 36  
2 wherein checking for the presence of a primary communication module and promoting to primary  
3 status further comprises:

- 4 assuming a secondary communication module status;  
5 broadcasting a request for a response from the primary communication module;  
6 starting a timer;  
7 self promoting to be the primary communication module if no response to the request is  
8 received before the timer expires; and

9 remaining in the secondary communication module status if the response is received from  
10 the primary communication module before the timer expires.

1 38. A rack mounted computer system comprising:  
2 a plurality of computers mounted in the rack mounted computer system;  
3 a central power supply means for supplying power to the plurality of computers, the central  
4 power supply means mounted in the rack mounted computer system;  
5 a first communication means for facilitating message transfer between the plurality of  
6 computers and the power supply means;  
7 wherein each of the plurality of computers is adapted to request permission across the first  
8 communication means to draw power from the central power supply means; and  
9 wherein a response to the request for permission is sent across the first communication  
10 means , the response based on an available power capacity of the central power supply means.

1 39. The rack mounted computer system as defined in claim 38 wherein the first communication  
2 means further comprises a serial communication pathway.

1 40 The rack mounted computer system as defined in claim 39 wherein the serial  
2 communication pathway further comprises an RS-485 serial bus.

1 41. The rack mounted computer system as defined in claim 38 further comprising:  
2 a chassis means for housing the plurality of computers, the chassis means in the rack  
3 mounted system;

4 a chassis communication means for facilitating message transfers from the plurality of  
5 computers, the chassis communication means coupled to the first communication means, the  
6 chassis communication means also coupled to the plurality of computers by way of a second  
7 communication means; and

8 wherein each of the plurality of computers requests permission to draw power from the  
9 central power supply means by sending those requests to the chassis communication means across  
10 the second communication means; and

11 wherein the chassis communication means forwards each request for permission to draw  
12 power across the first communication means to the central power supply means.

1 42. The rack mounted computer system as defined in claim 38 further comprising:

2 said central power supply means comprising a plurality of individual power supplies;

3 a power supply communication means for facilitating message transfer to the central power  
4 supply means, the power supply communication means coupled to each individual power supply  
5 through a third communication means;

6 said power supply communication means generating the response to the request for  
7 permission to draw power by polling each individual power supply across the third communication  
8 means to determine remaining power capacity of the central power supply means, the power  
9 supply communication means sending the response across the first communication means.

1 43. The rack mounted computer system as defined in claim 42 further comprising:

2 a chassis means for housing the plurality of computers, the chassis means in the rack  
3 mounted system;

4 a chassis communication means for facilitating message transfers from the plurality of  
5 computers, the chassis communication means coupled to the first communication means, the  
6 chassis communication means also coupled to the plurality of computers by way of a second  
7 communication means; and

8 wherein each of the plurality of computers requests permission to draw power from the  
9 central power supply means by sending those requests to the chassis communication means across  
10 the second communication means; and

11 wherein the chassis communication means forwards each request for permission to draw  
12 power across the first communication means to the central power supply means.

1 44. The rack mounted computer system as defined in claim 43 wherein the first communication  
2 means further comprises a serial communication pathway.

1 45. The rack mounted computer system as defined in claim 44 wherein the serial  
2 communication pathway further comprises an RS-485 serial bus.

1 46. The rack mounted computer system as defined in claim 43 wherein the second and third  
2 communication means further comprise serial communication pathways.

1 47. The rack mounted computer system as defined in claim 46 wherein each of the second and  
2 third serial communication pathways further comprise an I<sup>2</sup>C bus.

1 48. The rack mounted computer system as defined in claim 38 further comprising:

2 a power supply communication means for facilitating message transfer from the plurality of  
3 computers to the power supply means, the power supply communication means coupled to the  
4 plurality of computers across the first communication means, the power supply communication  
5 means also coupled to the central power supply means across a third communication means;

6 said central power means further comprises:

7 a plurality of individual power supplies, each individual power supply having a  
8 health and status monitoring means for monitoring an operating condition of each individual power  
9 supply; and

10 wherein each of said health and status monitoring means communicates the  
11 operating condition of its associated individual power supply to the power supply communication  
12 means across the second communication means;

13 wherein the power supply communication means requests a non-critical computer of the  
14 plurality of computers to shut down when a health and status monitoring means indicates a change  
15 in the operating condition of its associated individual power supply.

1 49. The rack mounted computer system as defined in claim 48 wherein the power supply  
2 communication means requests the non-critical computer of the plurality of computers to shut  
3 down when a first health and status monitoring mans for a first individual power supply indicates a  
4 failure of the first individual power supply.